

1/24

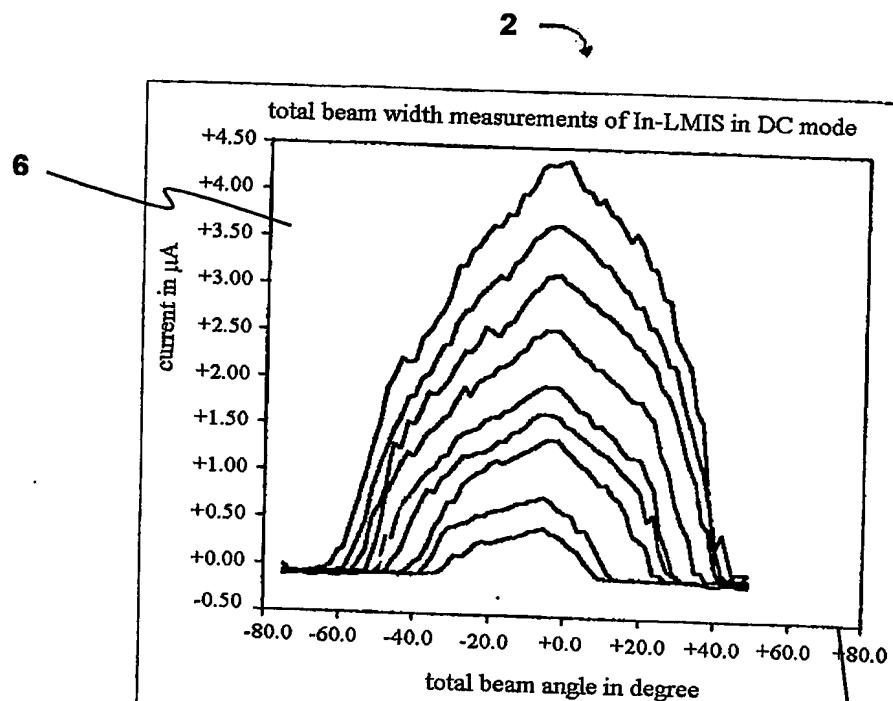


FIG.1

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2/24

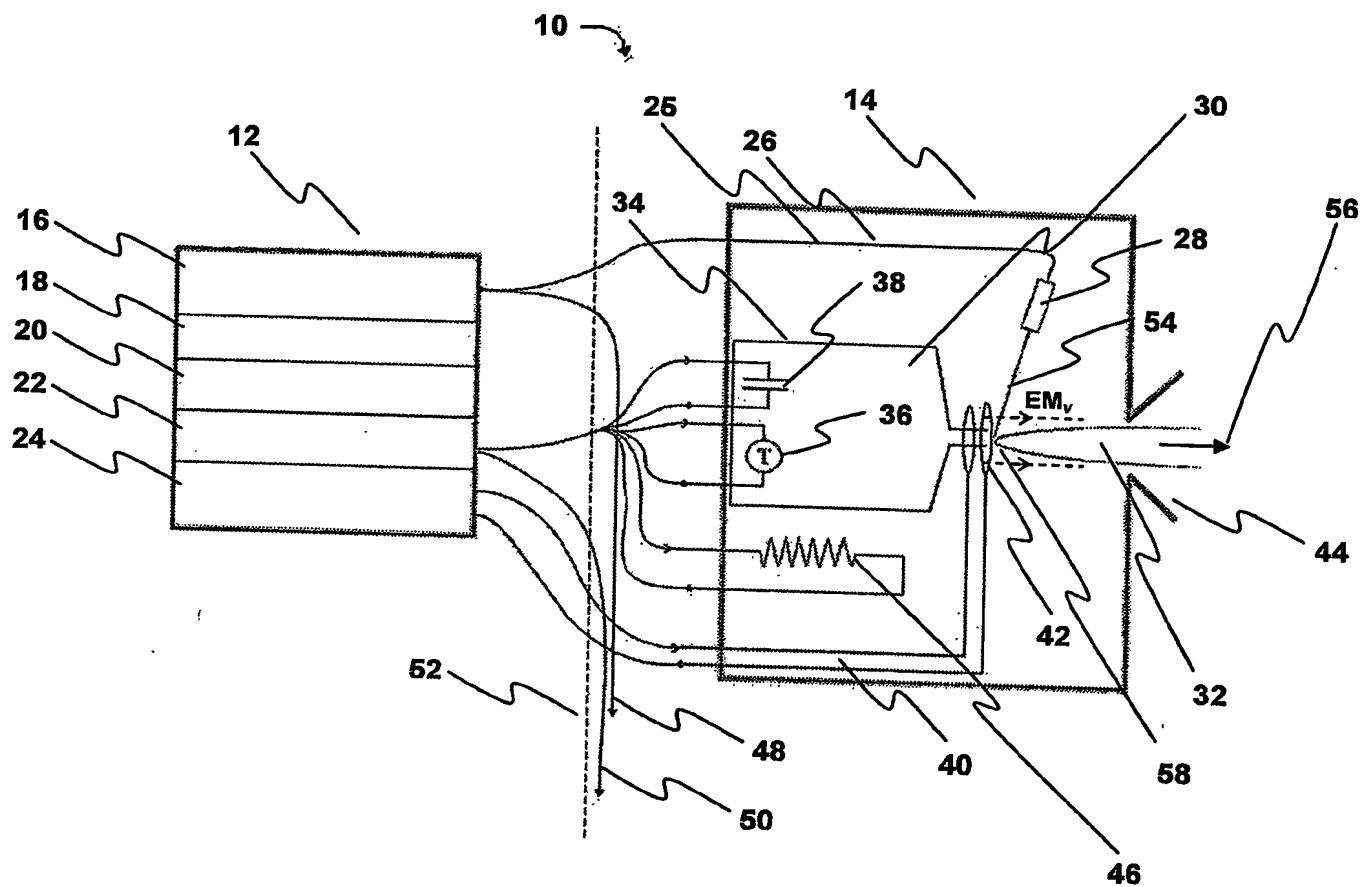


FIG. 2

3/24

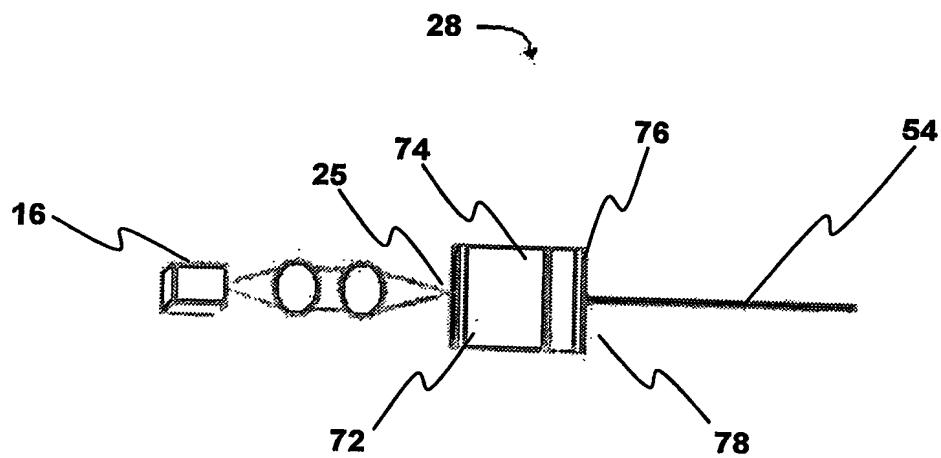
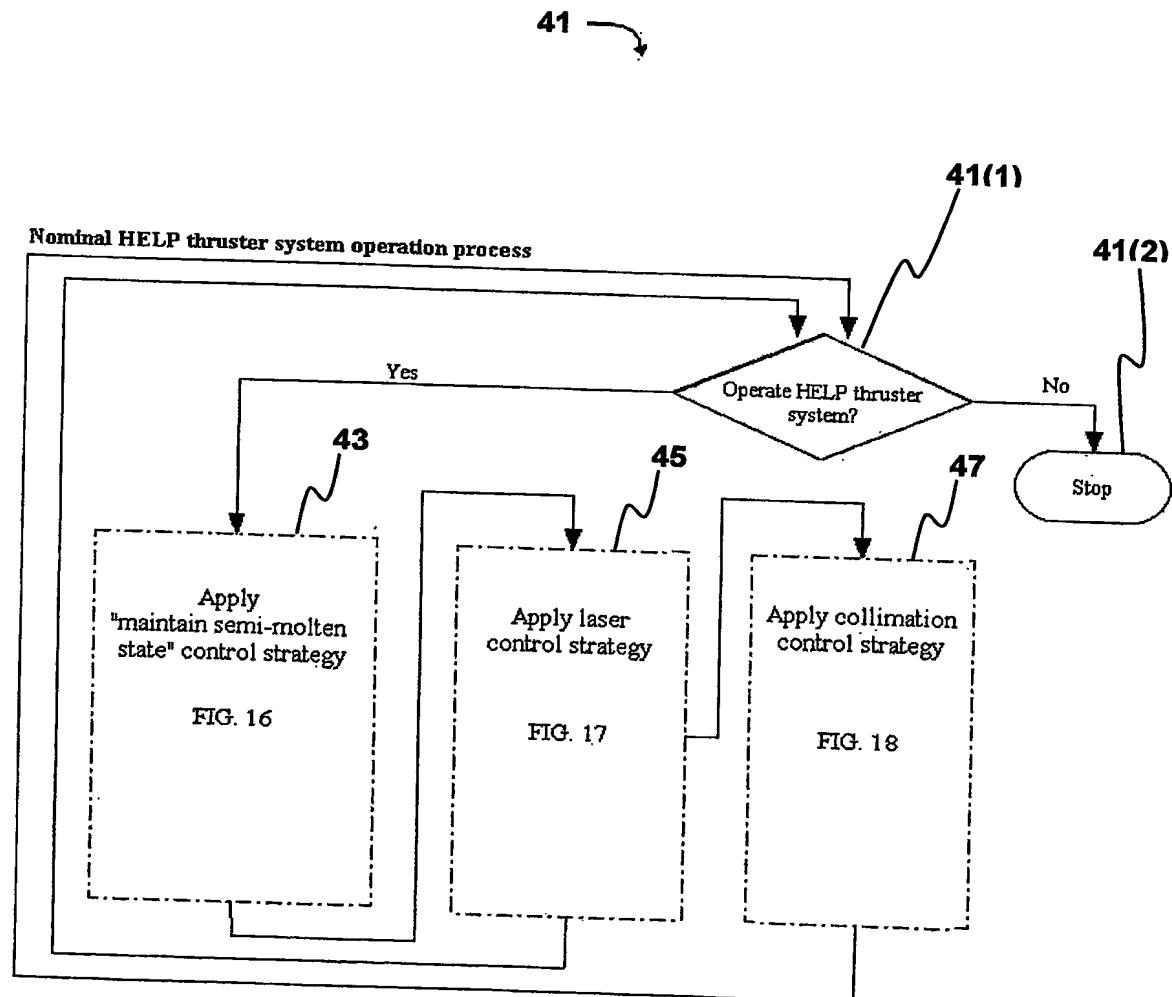


FIG. 3

4/24

**FIG. 4**

5/24

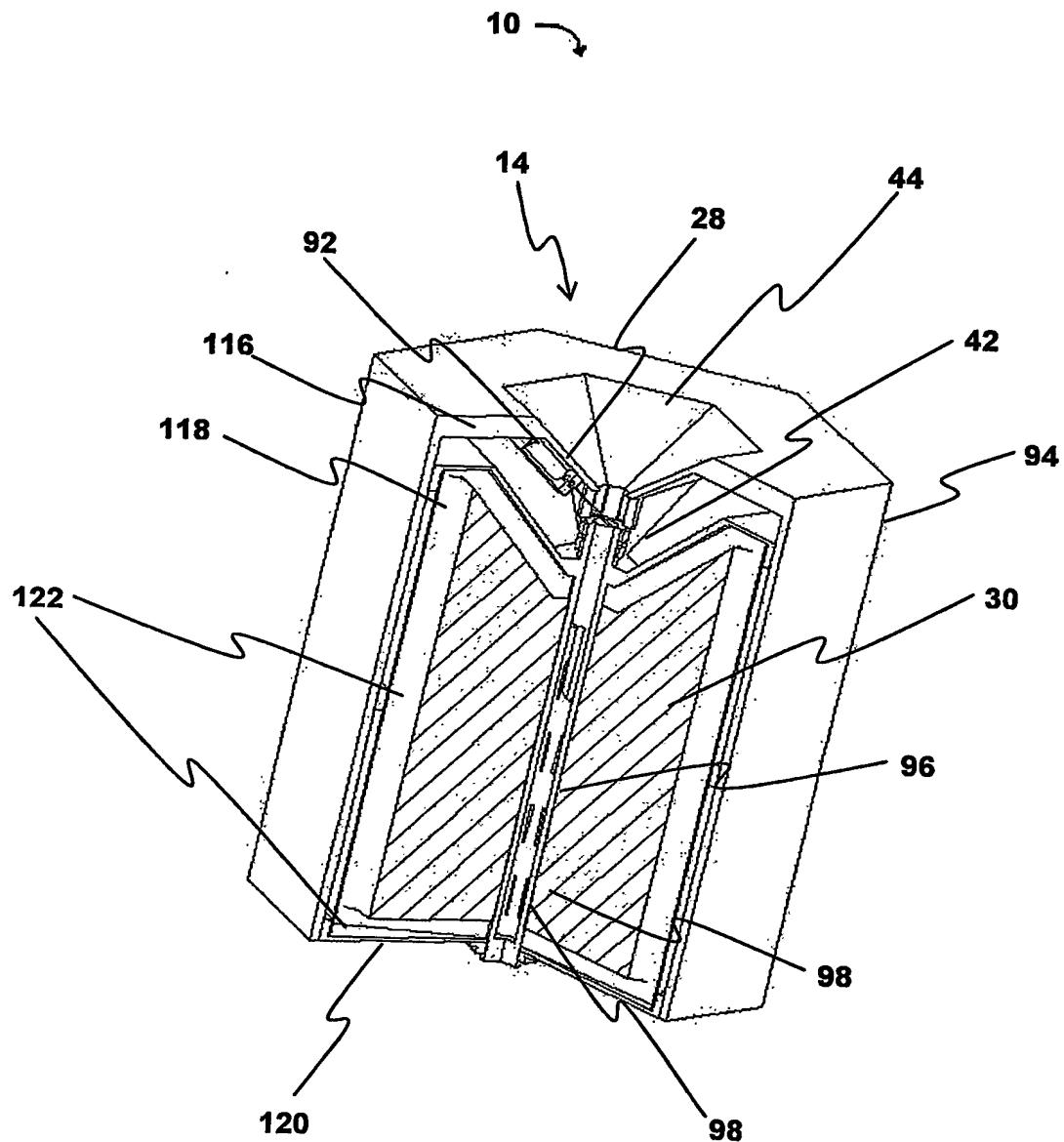


FIG. 5

6/24

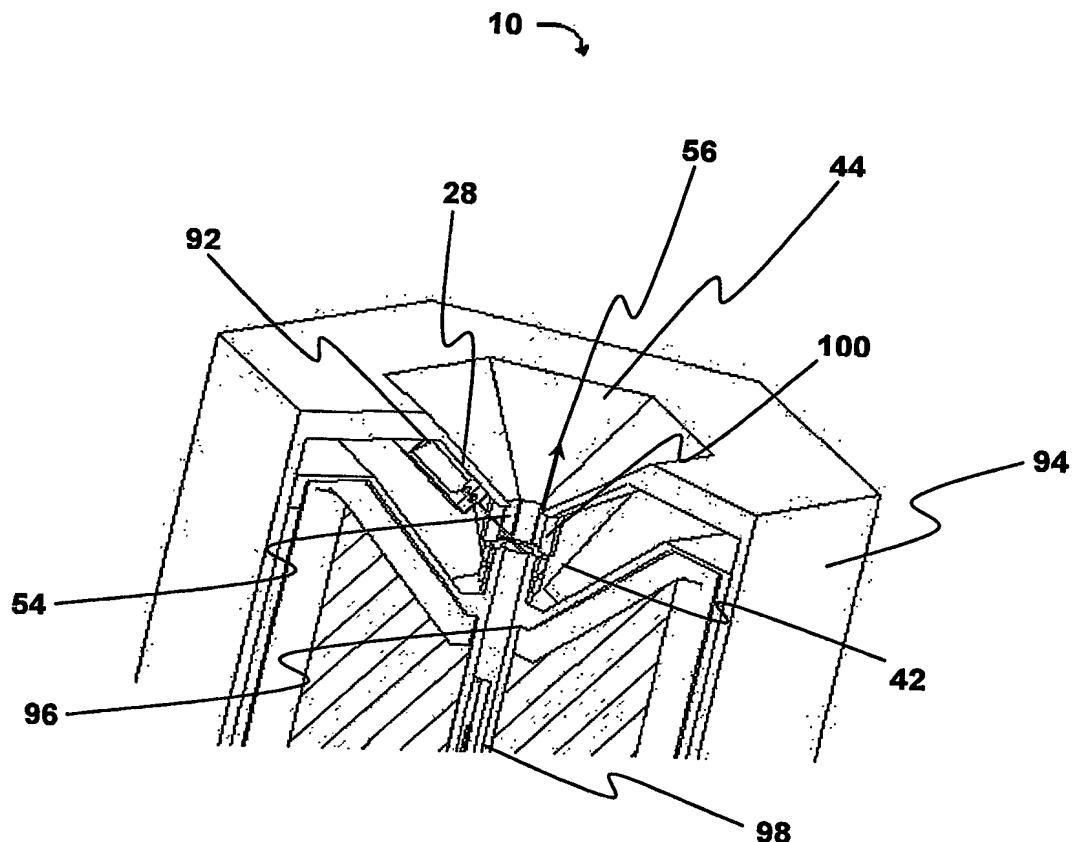


FIG. 6

7/24

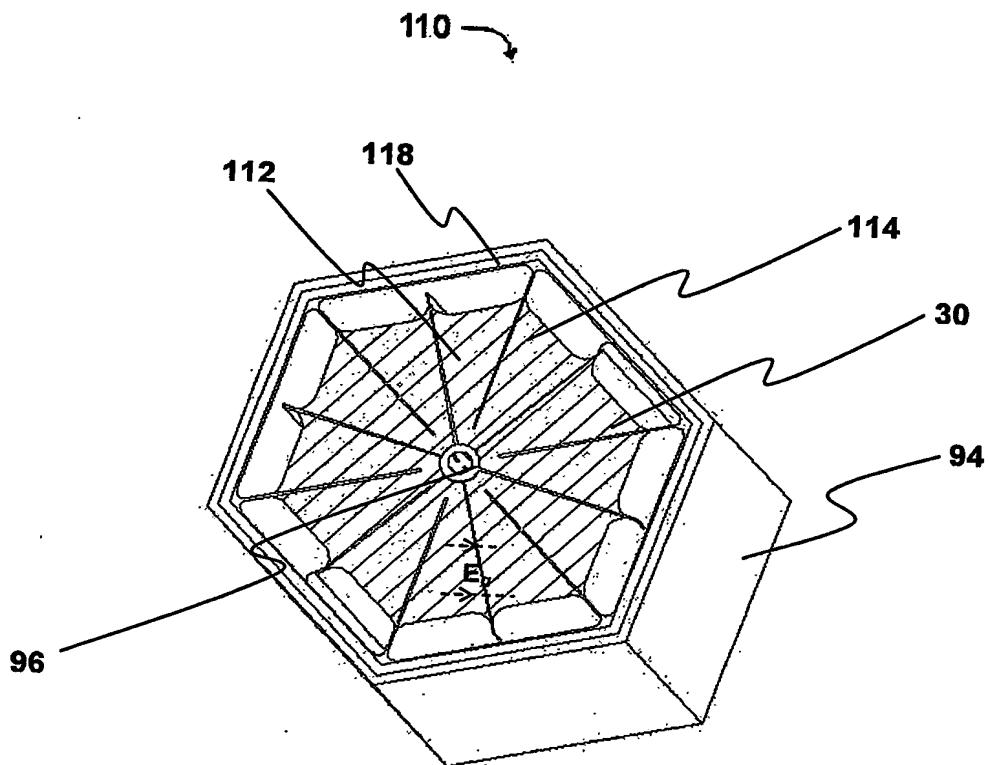


FIG. 7

8/24

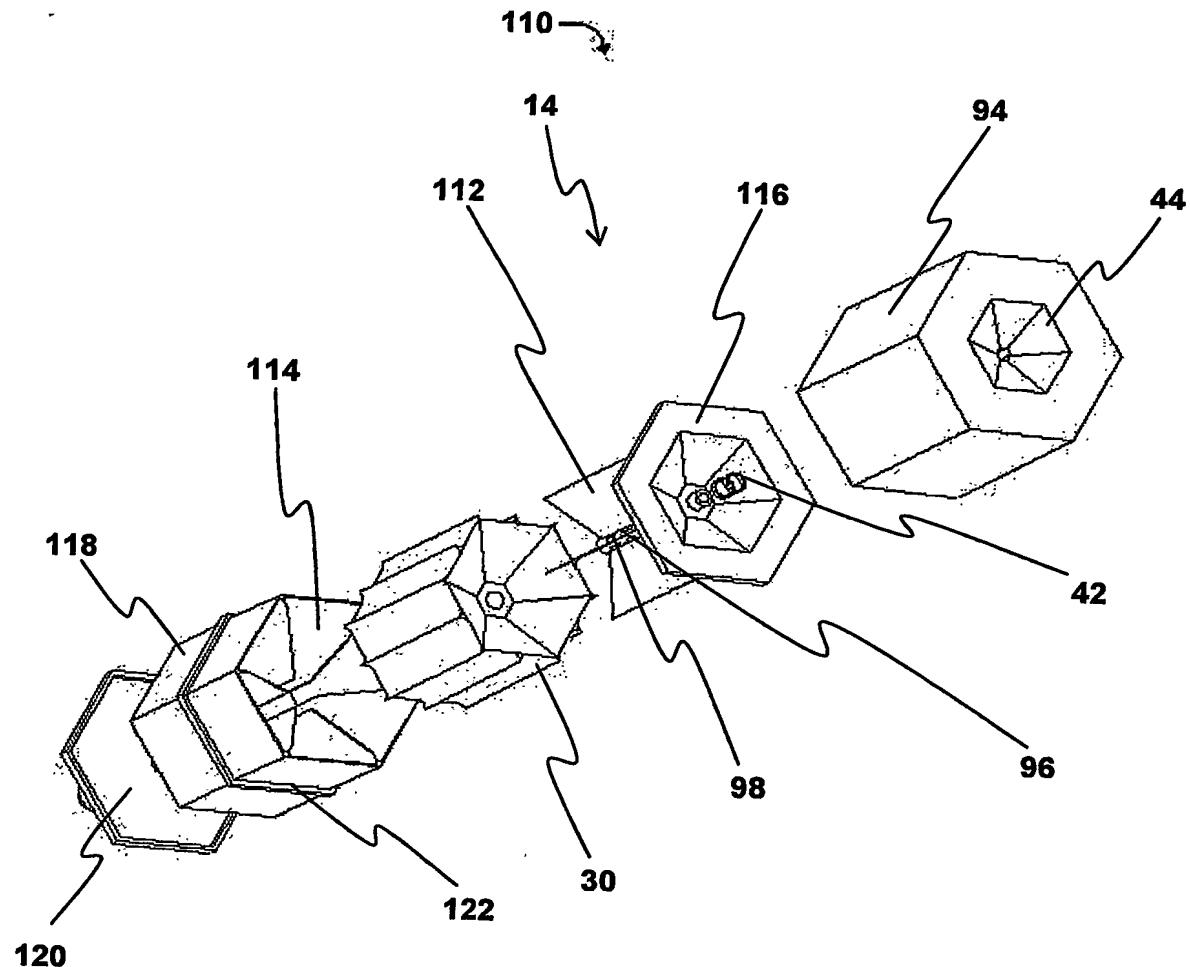


FIG. 8

9/24

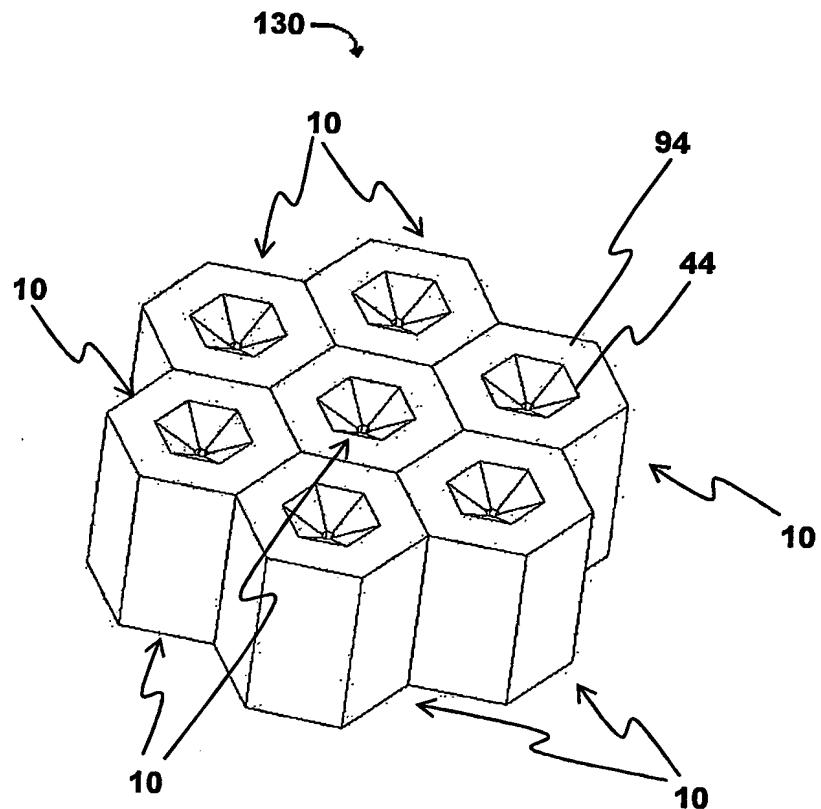


FIG. 9

10/24

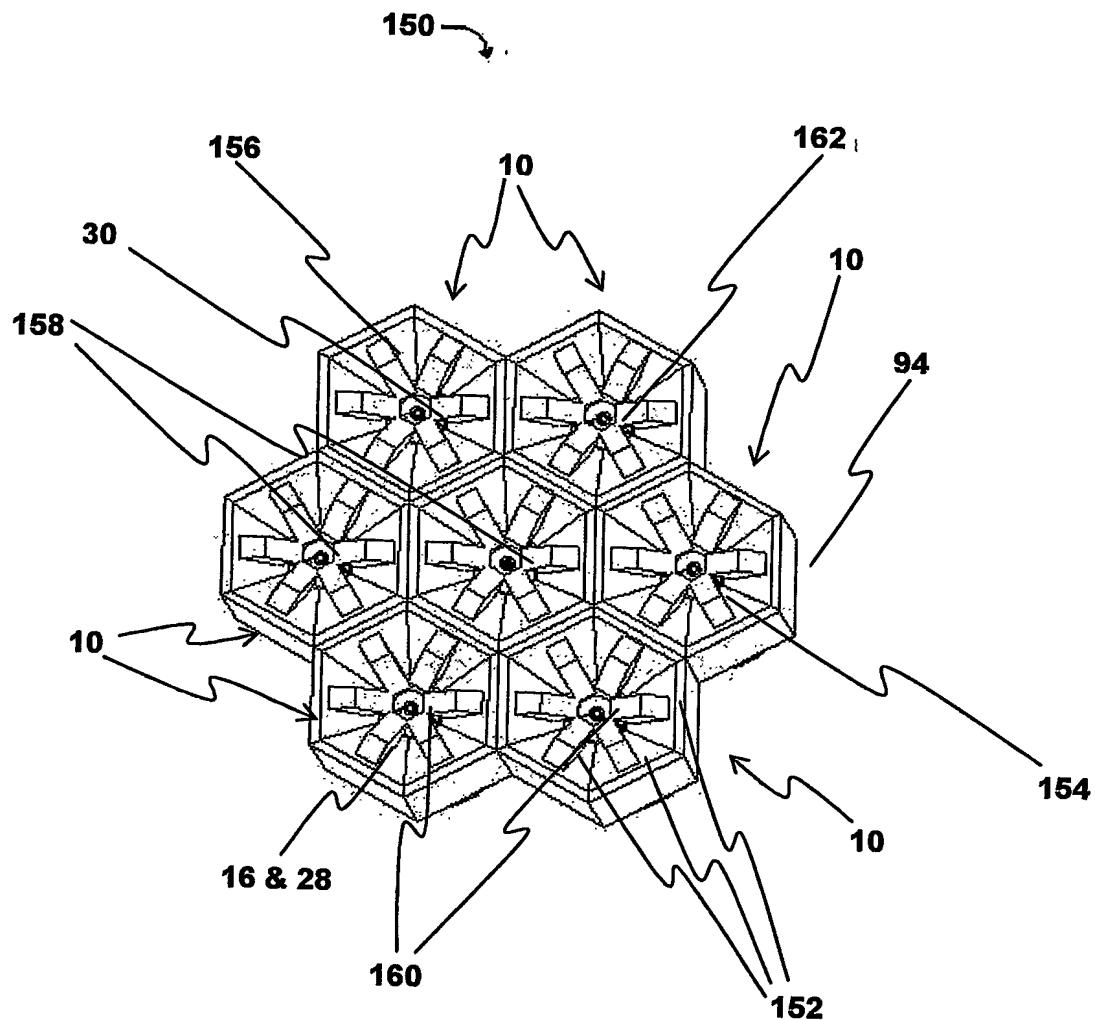


FIG. 10

11/24

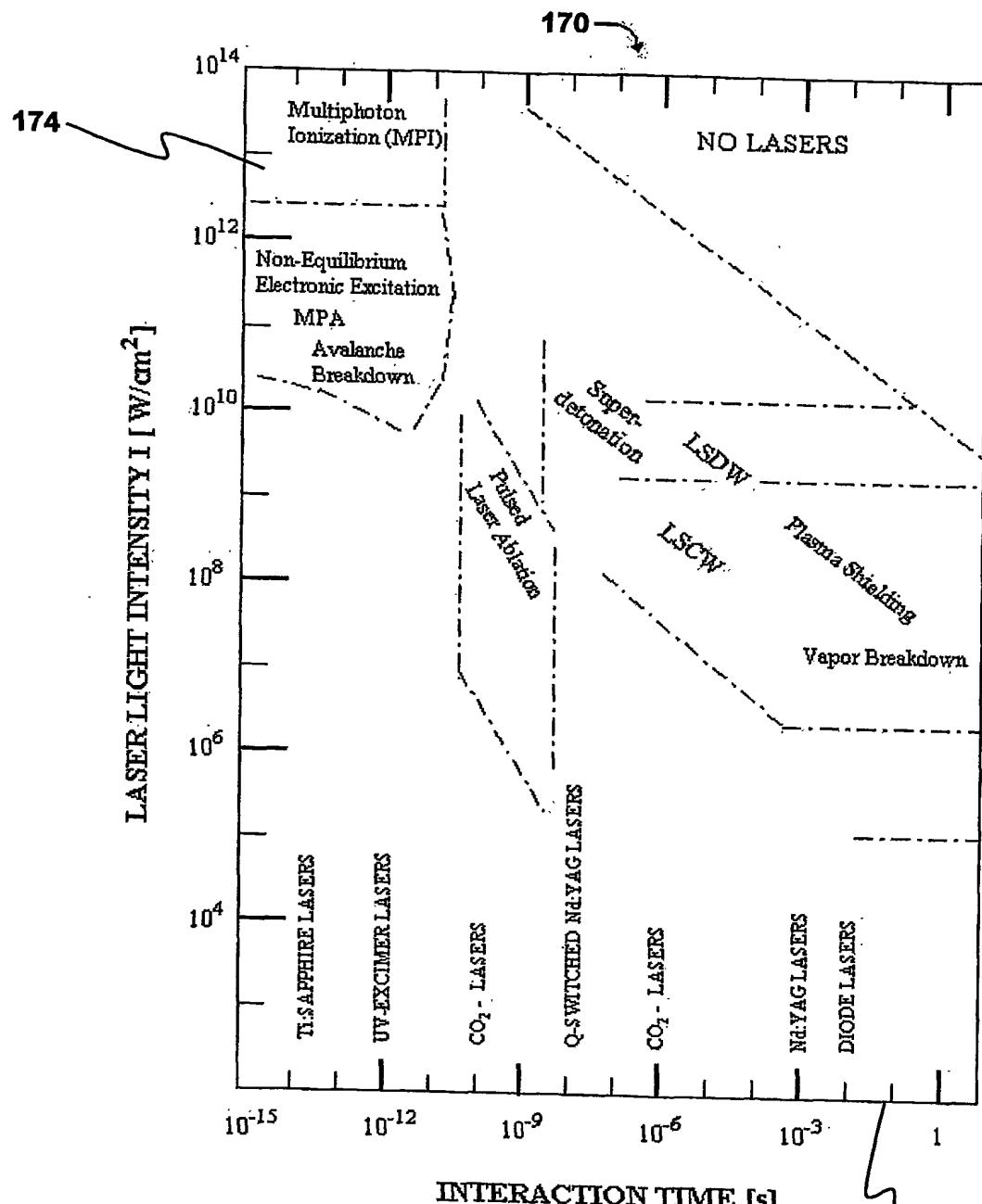


FIG. 11

172

12/24

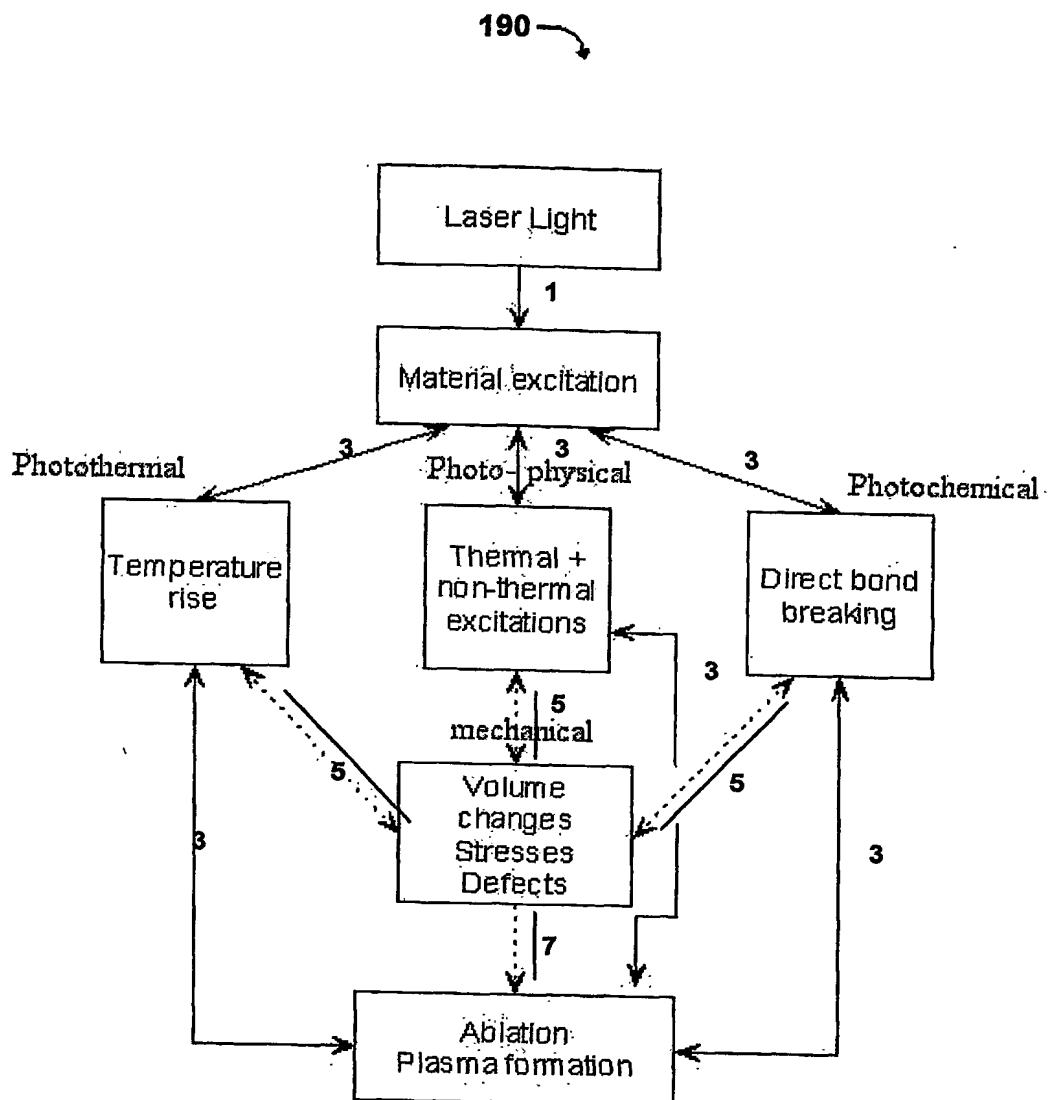


FIG. 12

13/24

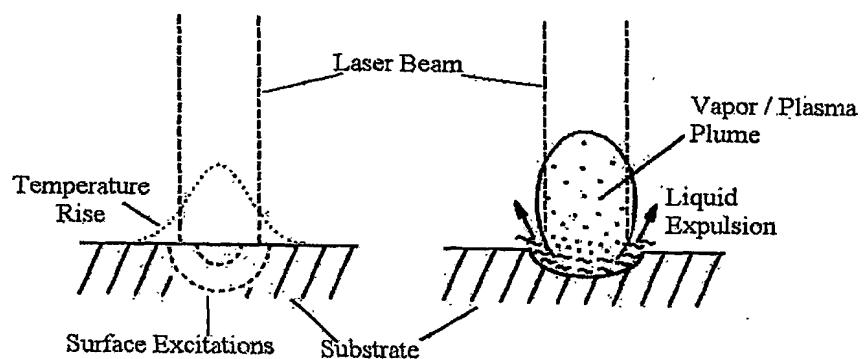


FIG. 13

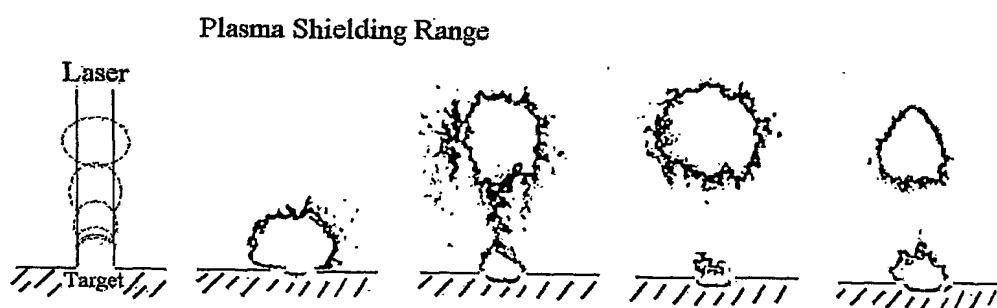


FIG. 14

14/24

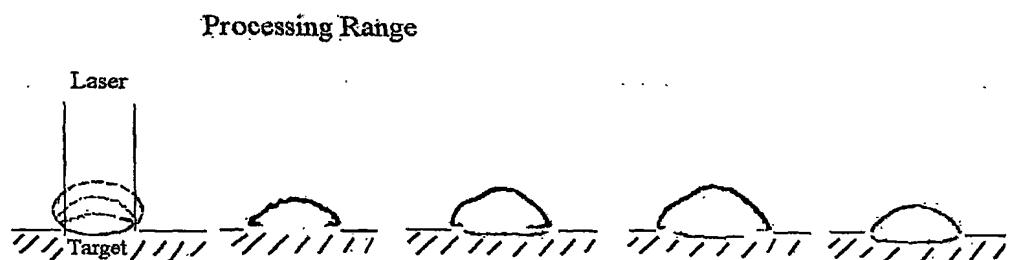


FIG. 15

15/24

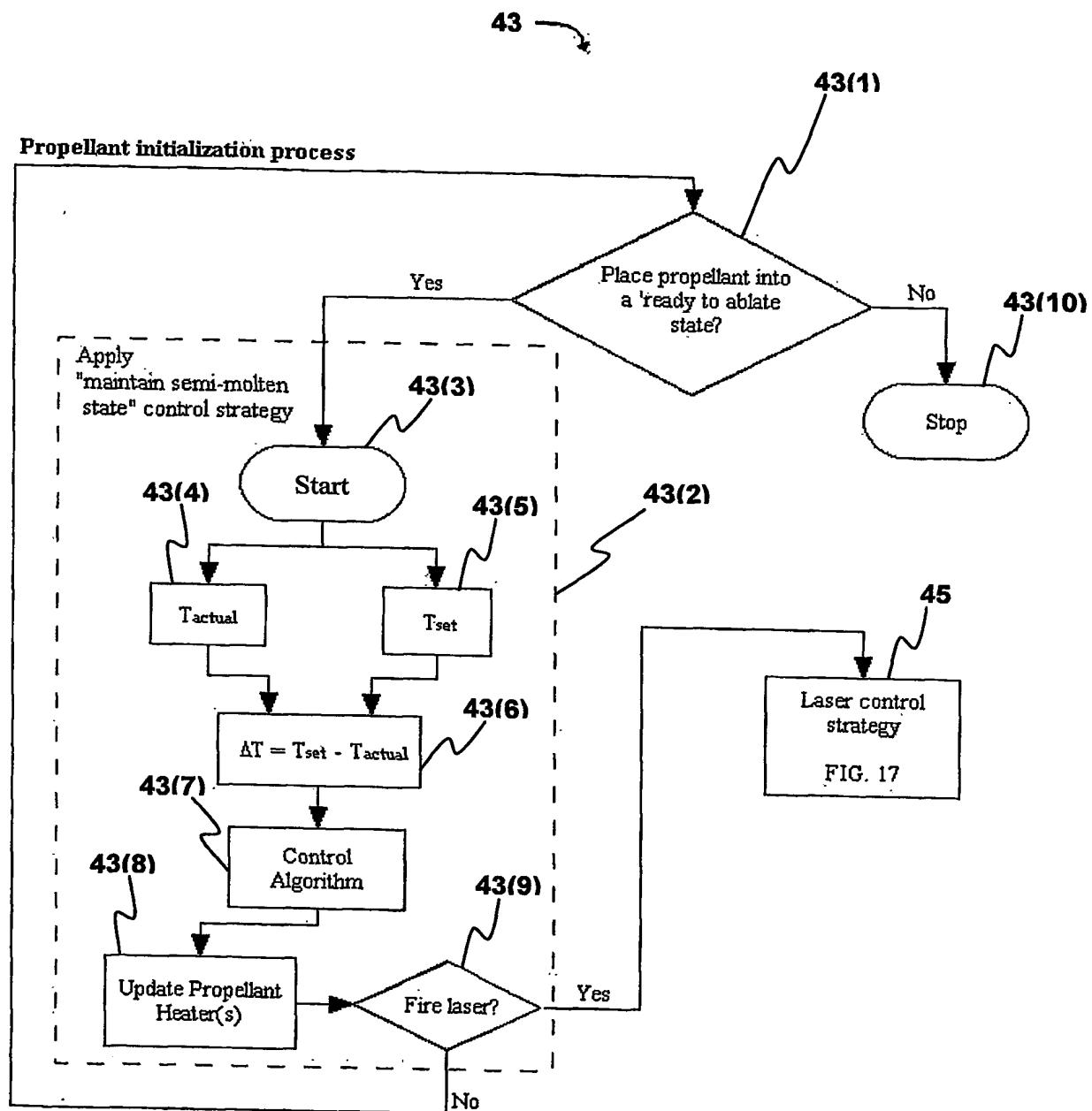


FIG. 16

16/24

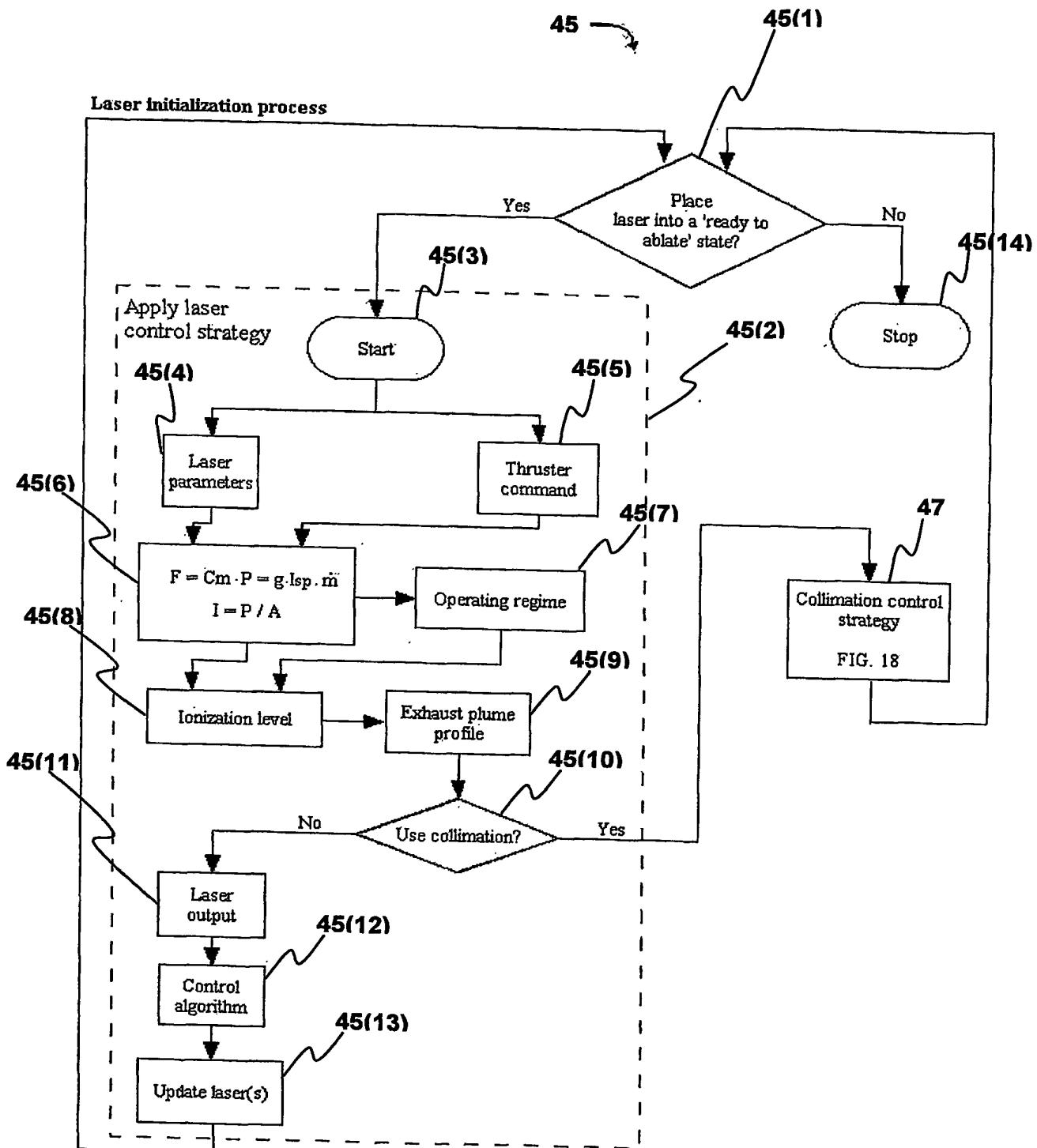


FIG. 17

17/24

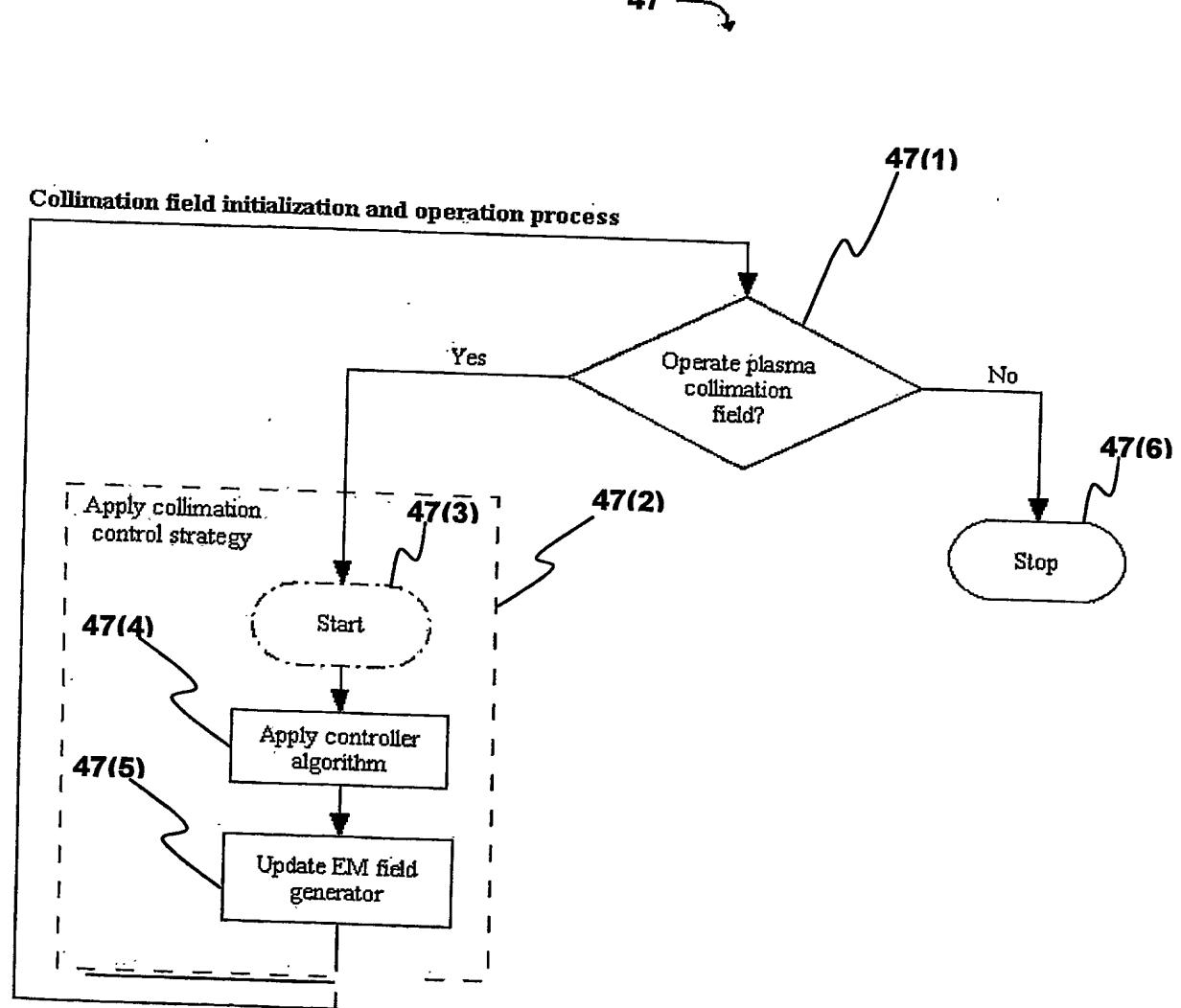


FIG. 18

18/24

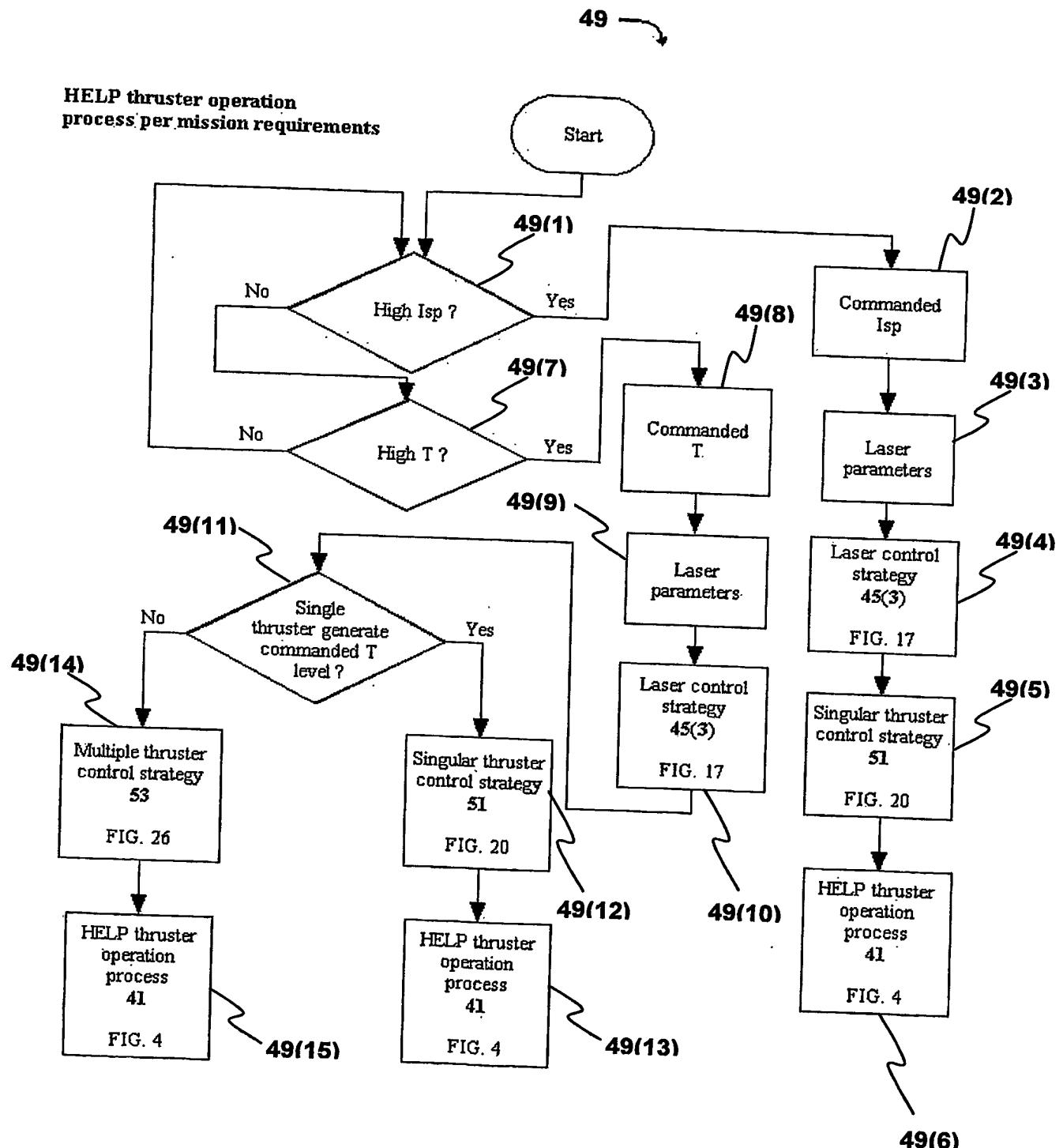
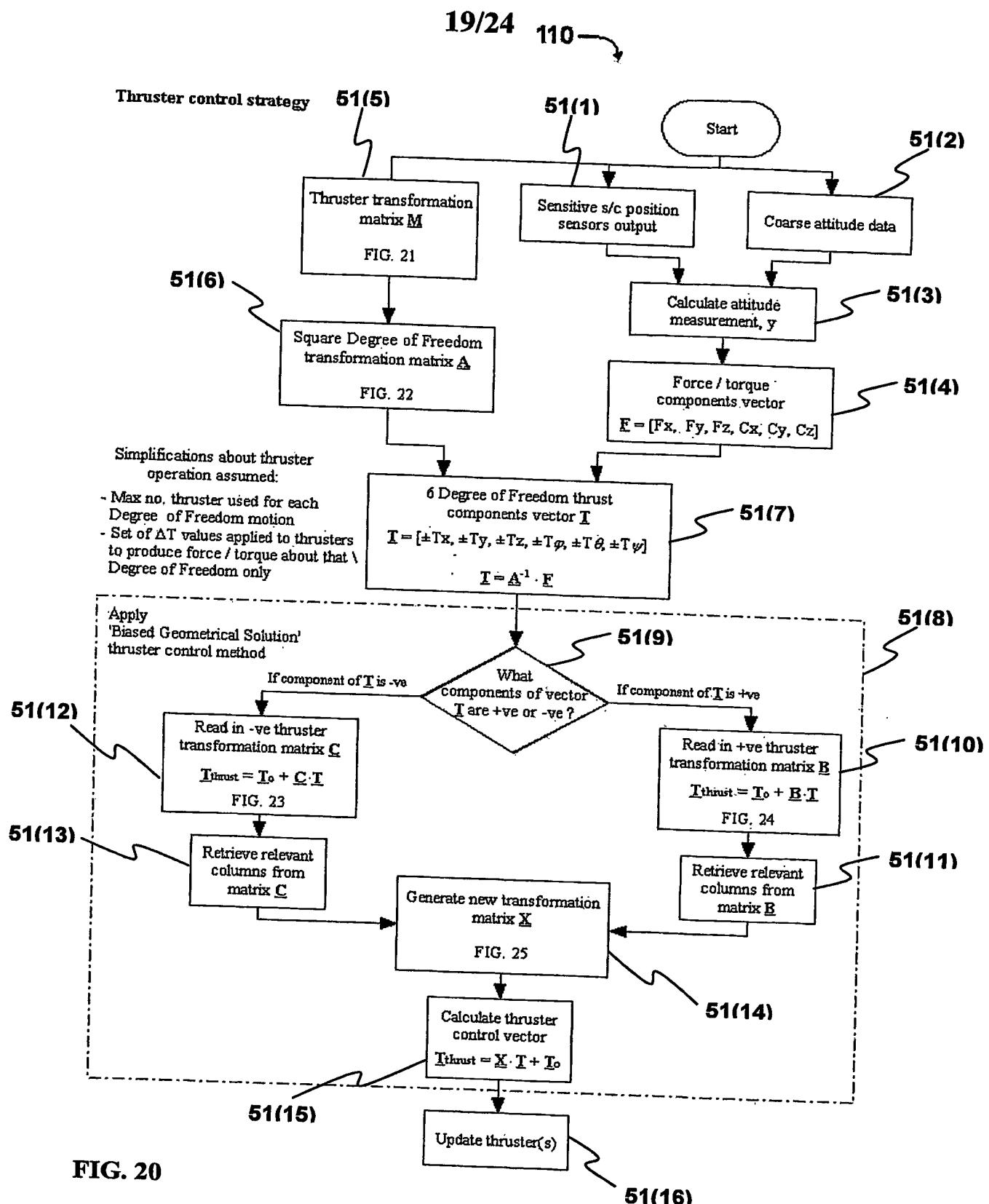


FIG. 19



20/24

$$\begin{aligned}
 \underline{F} &= \underline{M} \\
 &= \begin{bmatrix} F_x & \cos 70^\circ & \cos 70^\circ & \cos 70^\circ & 0 & \cos 20^\circ * & \cos 30^\circ & \cos 30^\circ & \cos 30^\circ * & \cos 70^\circ & -\cos 70^\circ & -\cos 70^\circ & 0 & -\cos 20^\circ * & \cos 20^\circ * \\ F_y & 0 & \cos 20^\circ * & -\cos 20^\circ * & -\cos 70^\circ & -\cos 70^\circ & 0 & -\cos 70^\circ & \cos 20^\circ * & \cos 30^\circ & \cos 30^\circ & \cos 30^\circ & 0 & \cos 30^\circ & \cos 30^\circ \\ F_z & = \cos 20^\circ & \cos 30^\circ & -\cos 30^\circ & \cos 30^\circ & \cos 20^\circ & -\cos 20^\circ * & \cos 20^\circ & \cos 20^\circ * & \cos 70^\circ \\ Q_\phi & 0 & 0 & 0 & 0 & -\cos 20^\circ * D & \cos 20^\circ * & \cos 60^\circ * D & \cos 60^\circ * D & \cos 60^\circ \\ C_\theta & -\cos 20^\circ D & \cos 20^\circ * & \cos 20^\circ * & 0 & 0 & 0 & \cos 20^\circ * D & \cos 20^\circ * D & \cos 60^\circ * D \\ C_\psi & 0 & \cos 20^\circ * & \cos 20^\circ * & \cos 30^\circ * D \end{bmatrix} \\
 & \quad \begin{matrix} \mathbf{T}_{\text{thrust}} \\ \mathbf{T}_1 \\ \mathbf{T}_2 \\ \mathbf{T}_3 \\ \mathbf{T}_4 \\ \mathbf{T}_5 \\ \mathbf{T}_6 \\ \mathbf{T}_7 \\ \mathbf{T}_8 \\ \mathbf{T}_9 \\ \mathbf{T}_{10} \\ \mathbf{T}_{11} \\ \mathbf{T}_{12} \end{matrix}
 \end{aligned}$$

Where

F = Force

C = Torque

T = Thrust

FIG. 21

21/24

<u>F</u>	<u>A</u>						<u>T</u>
$F_x$	$(3\cos 70^\circ + 2\cos 20^\circ * \cos 30^\circ)$	0	0	0	0	0	$T_x$
$F_y$	0	$(3\cos 70^\circ + 2\cos 20^\circ * \cos 30^\circ)$	0	0	0	0	$T_y$
$F_z$	0	0	$(4\cos 20^\circ)$	0	0	0	$T_z$
$C_\phi$	0	0	0	$(2\cos 20^\circ * D + 2\cos 20^\circ * \cos 60^\circ * D)$	0	0	$T_\phi$
$C_\theta$	0	0	0	0	$(2\cos 20^\circ * D + 2\cos 20^\circ * \cos 60^\circ * D)$	0	$T_\theta$
$C_\psi$	0	0	0	0	0	$(4\cos 20^\circ * \cos 60^\circ * D)$	$T_\psi$

FIG. 22

<u>T<sub>thrust</sub></u>	<u>C</u>	*	<u>T</u>	+	<u>T<sub>o</sub></u>			
<u>T<sub>thrust</sub></u>	<u>X</u>	<u>y</u>	<u>z</u>	<u><math>\phi</math></u>	<u><math>\theta</math></u>	<u><math>\psi</math></u>	<u>T</u>	<u>Bias thrust T<sub>o</sub></u>
T <sub>1</sub>	0	0.5	0	0	2	1	-T <sub>x</sub>	T <sub>o</sub>
T <sub>2</sub>	0	0	1	0.5	0	0	-T <sub>y</sub>	1
T <sub>3</sub>	0	1	1	0.5	0	1	-T <sub>z</sub>	1
T <sub>4</sub>	0.5	1	0	2	0	0	-T <sub><math>\phi</math></sub>	1
T <sub>5</sub>	0	1	1	0	0.5	0	-T <sub><math>\theta</math></sub>	1
T <sub>6</sub>	1	1	1	0	0.5	1	-T <sub><math>\psi</math></sub>	+ 1
T <sub>7</sub>	1	0.5	0	0	0	1		1
T <sub>8</sub>	1	1	1	0.5	1	0		1
T <sub>9</sub>	1	0	1	0.5	1	1		1
T <sub>10</sub>	0.5	0	0	0	0	0		1
T <sub>11</sub>	1	0	1	1	0.5	0		1
T <sub>12</sub>	0	0	1	1	0.5	1		1

FIG. 23

$$\underline{T}_{\text{thrust}} = \underline{B} * \underline{T} + \underline{T}_o$$

22/24

$\underline{T}_{\text{thrust}}$	$\underline{B}$						$\underline{T}$	Bias thrust $\underline{T}_o$
	x	y	z	$\phi$	$\theta$	$\psi$		
T1	1	0.5	1	0	0	1	$\underline{T}_x$	$\underline{T}_o$
T2	1	1	0	0.5	1	1	$\underline{T}_y$	1
T3	1	0	0	0.5	1	0	$\underline{T}_z$	1
T4	0.5	0	1	0	0	0	$\underline{T}_\phi$	1
T5	1	0	0	1	0.5	1	$\underline{T}_\theta$	1
T6	0	0	0	0.5	0.5	0	$\underline{T}_\psi$	1
T7	0	0.5	1	0	2	1		1
T8	0	0	0	0.5	0	1		1
T9	0	1	0	0.5	0	0		1
T10	0.5	1	1	2	0	0		1
T11	0	1	0	0	0.5	1		1
T12	1	1	0	0	0.5	0		1

FIG. 24

$$\underline{T}_{\text{thrust}} = \underline{X} * \underline{T} + \underline{T}_o$$

$\underline{T}_{\text{thrust}}$	$\underline{X}$						$\underline{T}$	Bias thrust $\underline{T}_o$
	x	y	z	$\phi$	$\theta$	$\psi$		
T1	0	0	0	0	0	0	$-\underline{T}_x$	$\underline{T}_o$
T2	0	0	0	0	0	0	$-\underline{T}_y$	1
T3	0	0	0	0	0	0	$-\underline{T}_z$	1
T4	0.5	0	0	0	0	0	$-\underline{T}_\phi$	1
T5	0	0	0	0	0	0	$-\underline{T}_\theta$	1
T6	1	0	0	0	0	0	$-\underline{T}_\psi$	1
T7	1	0	0	0	0	0		1
T8	1	0	0	0	0	0		1
T9	1	0	0	0	0	0		1
T10	0.5	0	0	0	0	0		1
T11	1	0	0	0	0	0		1
T12	0	0	0	0	0	0		1

FIG. 25

23/24

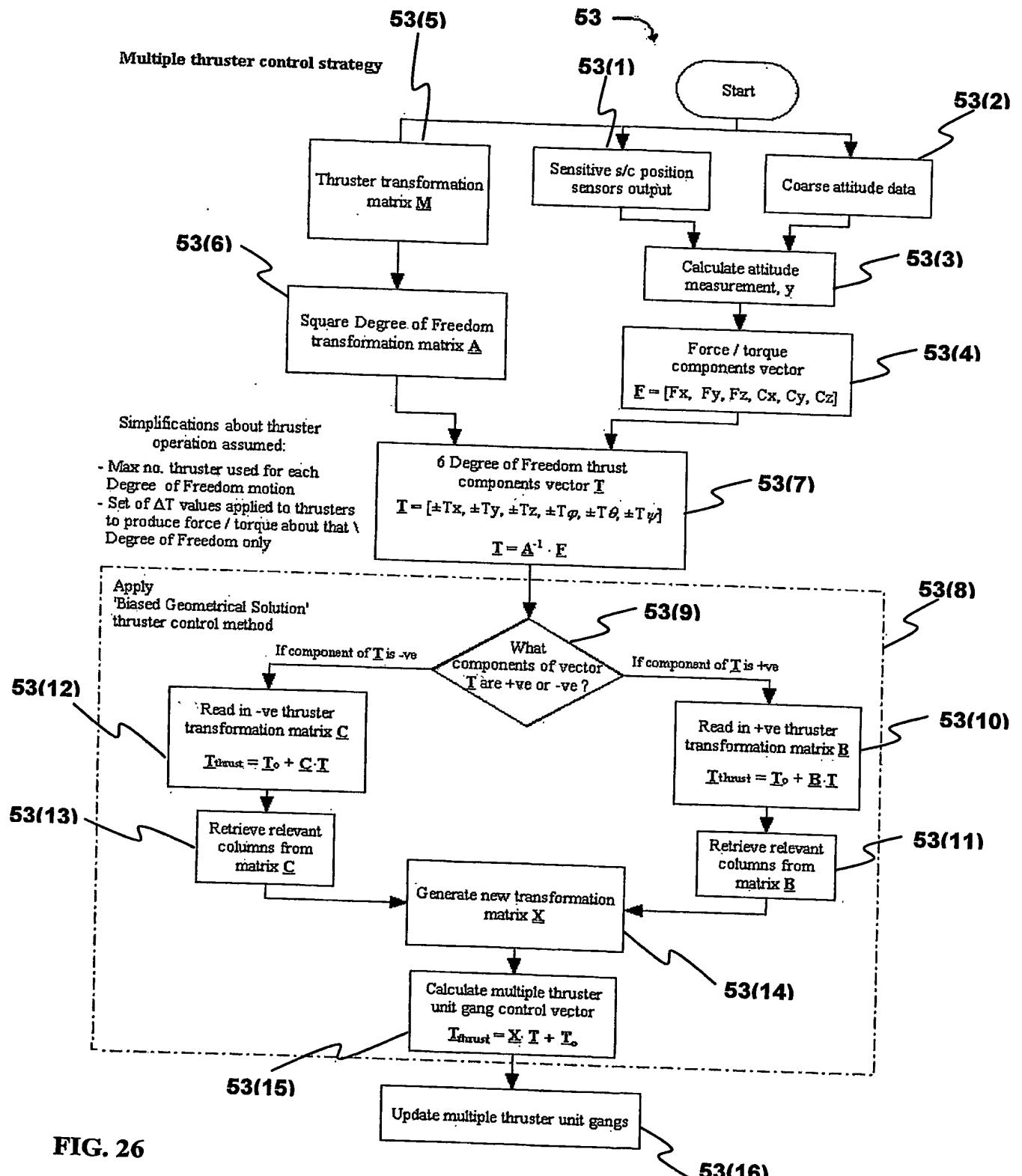
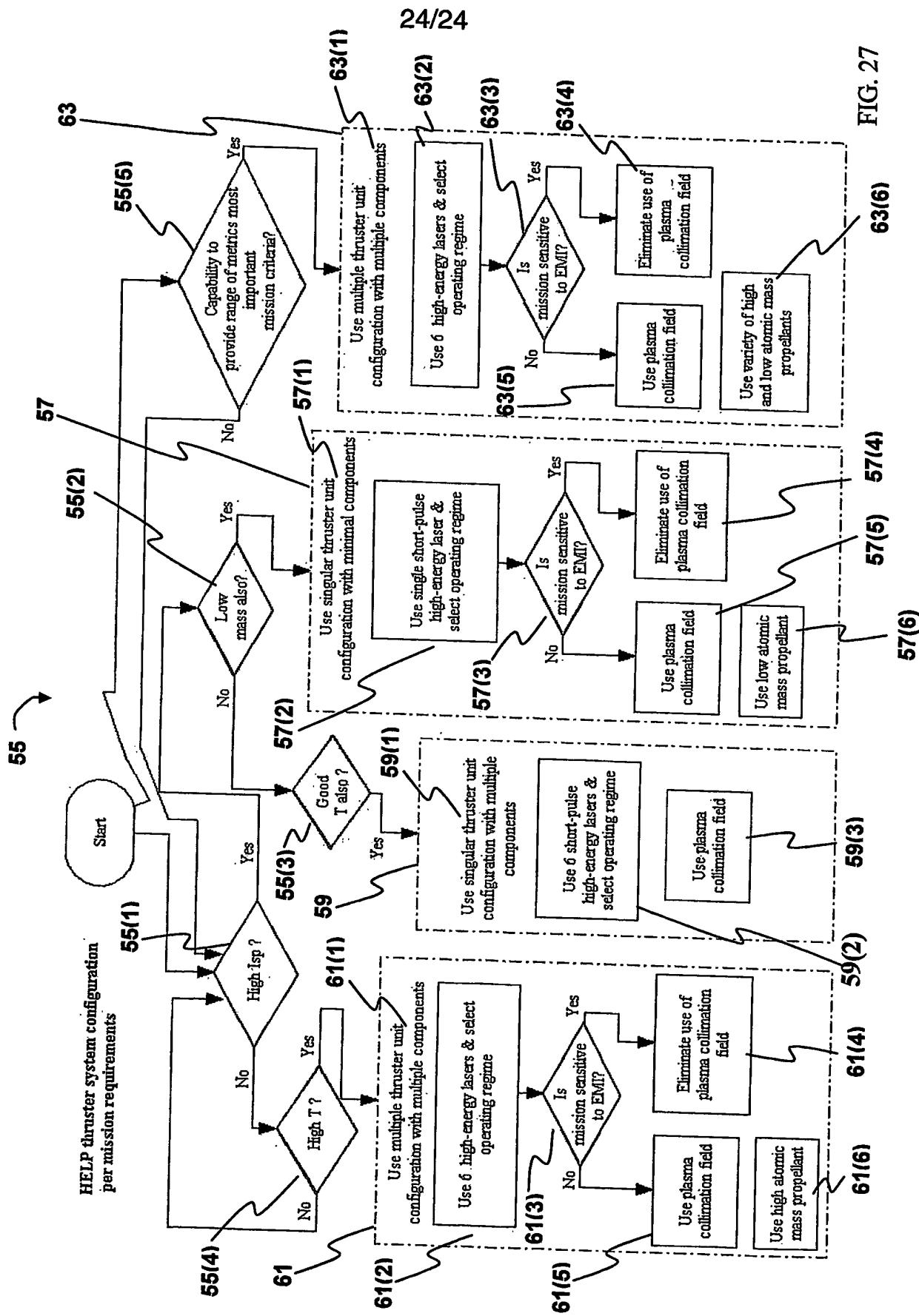


FIG. 26



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